

U.S. Army CECOM

Directorate for Safety

Presents an instruction on:

Radiofrequency Radiation Safety

Radiofrequency Radiation Safety

02/21/2003

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- 10) Installation Program Requirements
- 11) Vision and Ocular Assessments of RF Workers
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This Instruction Based On:

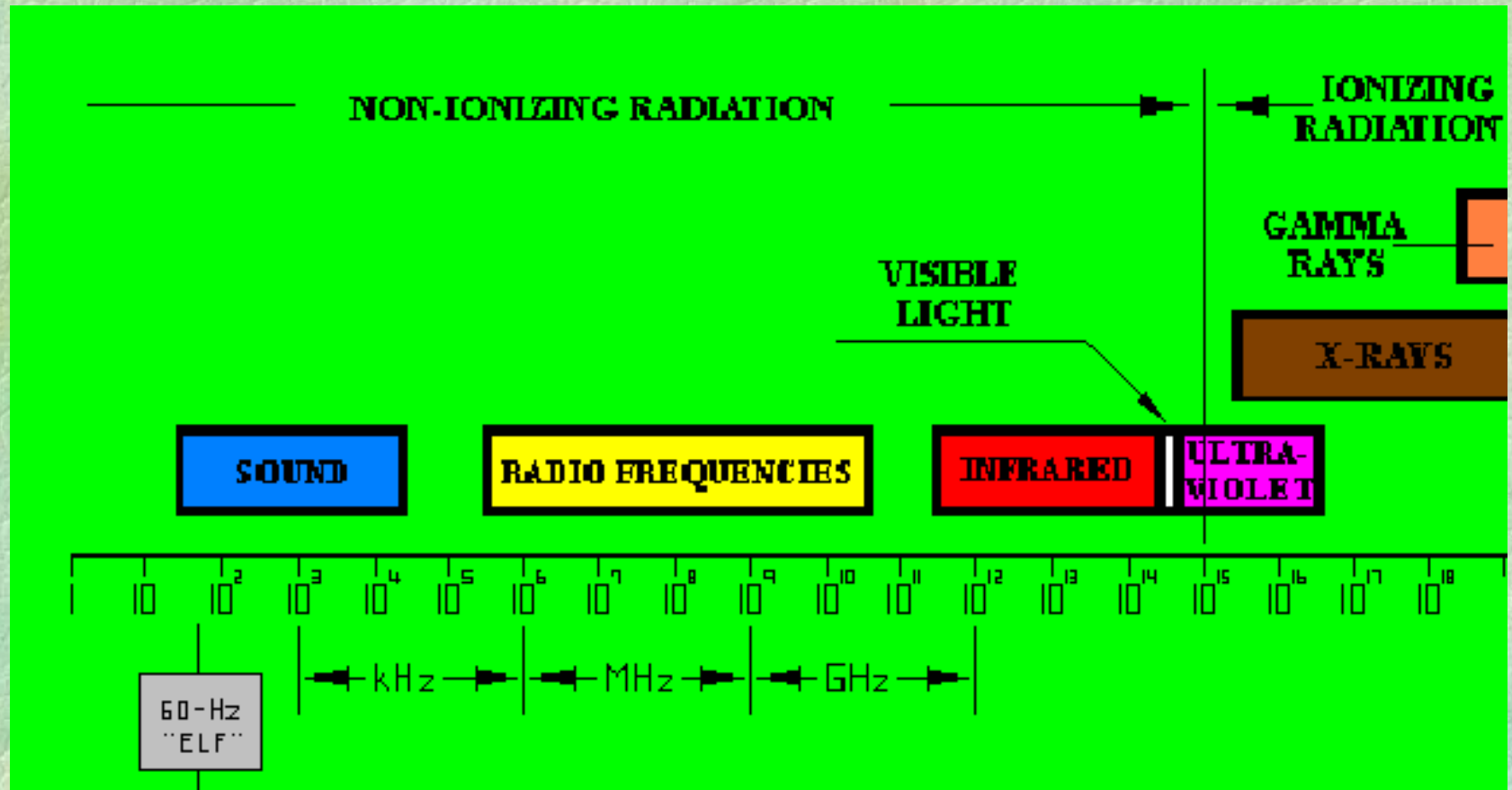
✿ Various Army Regulations and a Department of Defense (DoD) Instruction:

- **AR 11-9**
(The Army Radiation Safety Program)
- **AR 40-5**
(Preventive Medicine)
- **Army National Guard Regulation 385-11**
(Safety, Ionizing and Nonionizing Radiation Protection)
- **DoDI 6055.11**
(Protection of DoD Personnel from Exposure to Radiofrequency Radiation)

What is Radiofrequency Radiation?

☞ A form of electromagnetic radiation(EMR)

The Electromagnetic Spectrum



Electromagnetic Energy

☞ Classifications:

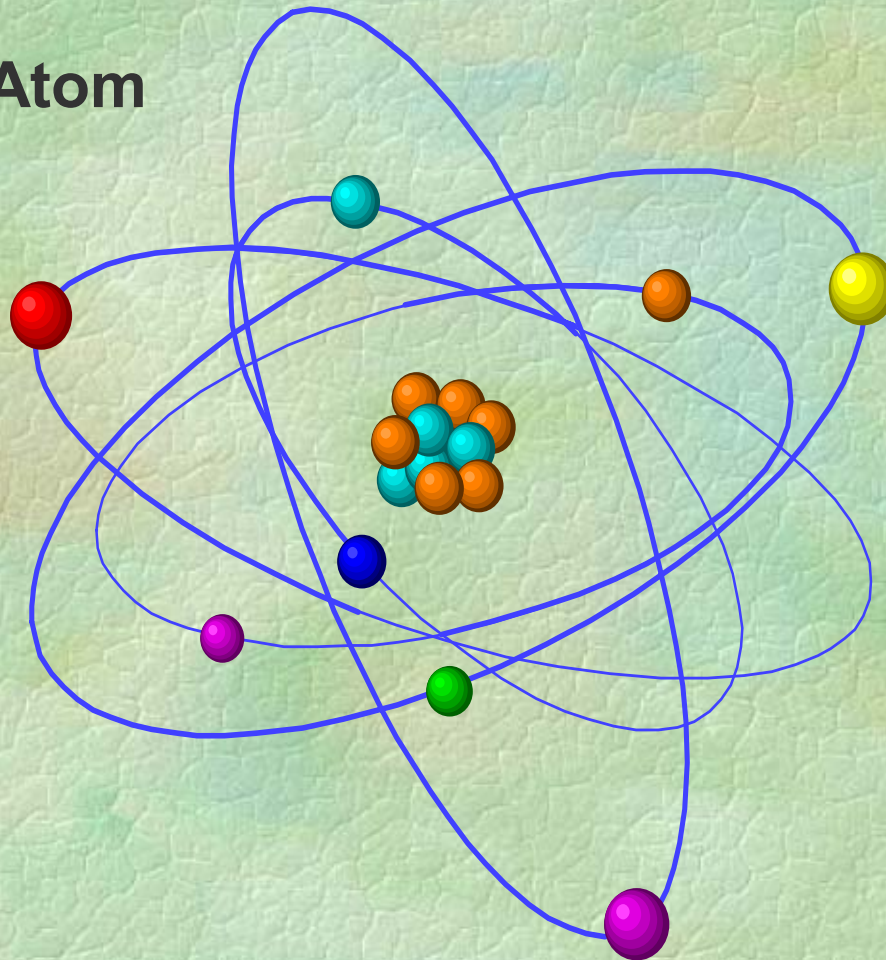
- Ionizing
- Non-ionizing

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Ionizing and Non-ionizing Radiation

The Atom



Incoming
Energy

First Ionization Potential (defn.)

- The first ionization potential of an element (gold, silver, oxygen, etc.)
 - Energy in electron-volts required to pull one electron off an isolated neutral atom of that element and is different for atoms of differing elements, compounds, etc.

Why is this?

☞ *Answer:*

- Atoms differ in their makeup from element to element (and therefore from substance to substance).
- Atoms of different elements have different quantities of “rings” or “shells” containing differing amounts of electrons.
- Fewer rings mean more attraction to the nucleus, therefore.....more difficult to “tear” off outer electrons.

First Ionization Potentials

- ☛ Cesium: 3.89 eV (lowest of the elements)
- ☛ Helium: 24.59 eV (highest of the elements)

Ionizing Energies for Human Tissue

- ✿ Human tissue is made mostly of water
- ✿ Water is a compound made of two elements:
 - Oxygen
 - Hydrogen
- ✿ Ionization of the water compound occurs at energies above about 12.4eV (we'll see this again later)
- ✿ Human tissue ionizes in the range of 12.4 to about 35eV

Comparative Ionization Levels

- ☞ Cesium's first Ionization Potential: 3.89eV
- ☞ Helium's first Ionization Potential: 24.59eV
- ☞ Ionization of Water Molecules: 12.4eV
- ☞ Ionization of Human Tissue: 12.4 - 35eV

Effects From Ionizing Radiation (for human tissue)

- ❧ Permanent changes at the atomic level (atoms are changed)
- ❧ Can cause faulty or defective “diagram”
 - as human tissue replaces itself normally, it does so with defective instructions
- ❧ Uncontrolled growth of changed/defective cells
- ❧ Cancer causing
- ❧ Can cause permanent changes in DNA/future generations (genetics)

Effects From Non-ionizing Radiation (for human tissue)

- ⌘ **Non**-permanent changes at atomic level
- ⌘ Will not cause faulty/defective tissue “diagram”
- ⌘ **No** uncontrolled growth of changed/defective cells
- ⌘ **Non**-cancer causing ?? (*more on this topic later*)
- ⌘ Will **not** directly cause permanent changes in DNA/future generations (genetics) (*more on this topic later*)
- ⌘ Temporary effects (burns, shocks, etc.)
- ⌘ **CAN** cause permanent effects (scarring, loss of eyesight, etc.)

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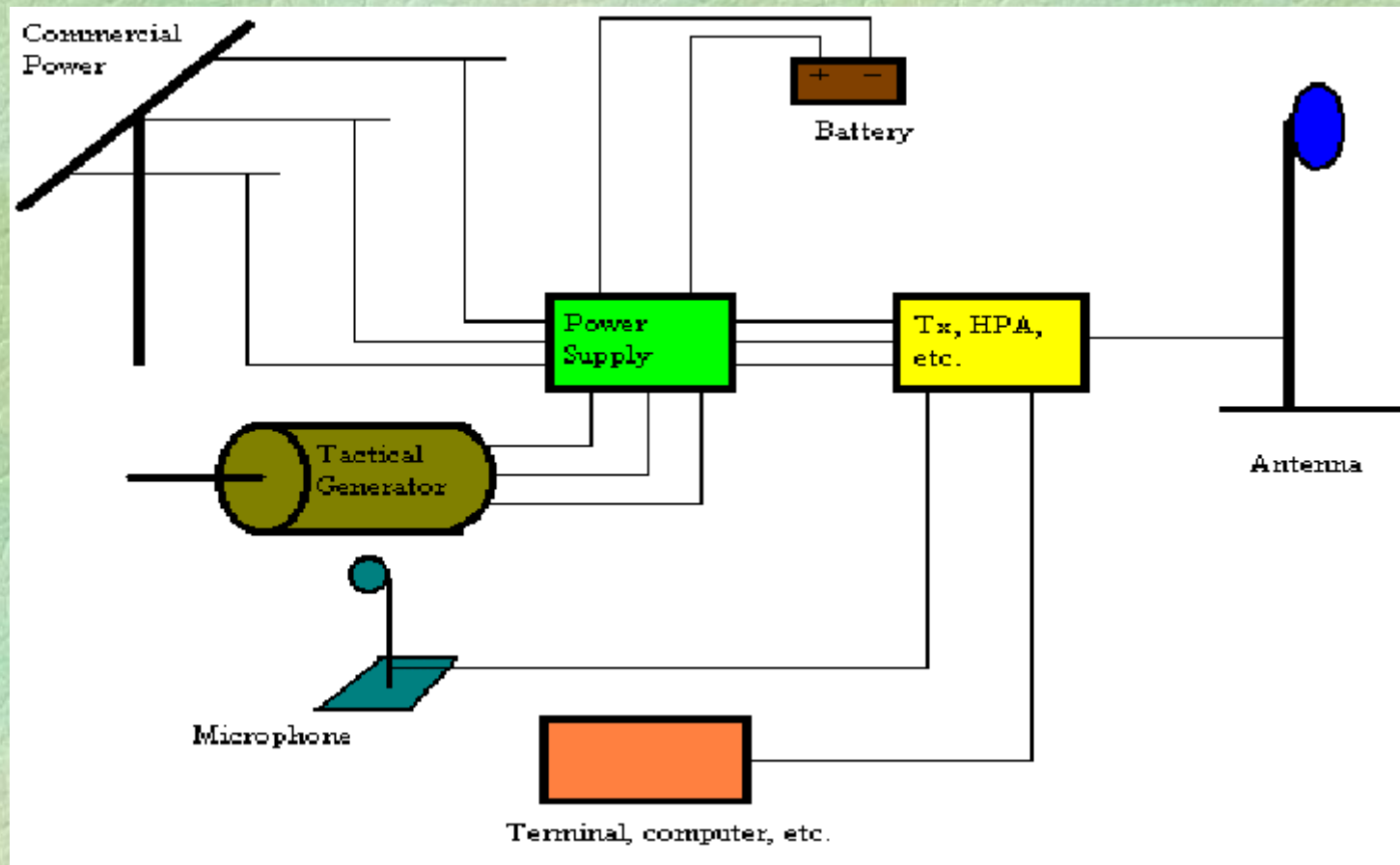
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Army Systems Producing RFR

- ✿ Aircraft Control Centrals
- ✿ Radar Sets
- ✿ Altimeter Sets
- ✿ Communications Centers and Terminals
- ✿ Countermeasures Sets
- ✿ Doppler Navigation Sets
- ✿ Interrogator Sets (IFF)
- ✿ Jammers
- ✿ Manpack Radios
- ✿ Radio Sets
- ✿ Satellite Communications Terminals
- ✿ Transponders
- ✿ Hand Held Radios

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Radiofrequency Energy Production



Radiofrequency Energy Production (cont'd)

$$\text{Energy} \propto \text{frequency}$$

$$E = h \nu \quad \text{or}$$

$$E = hf$$

Where:

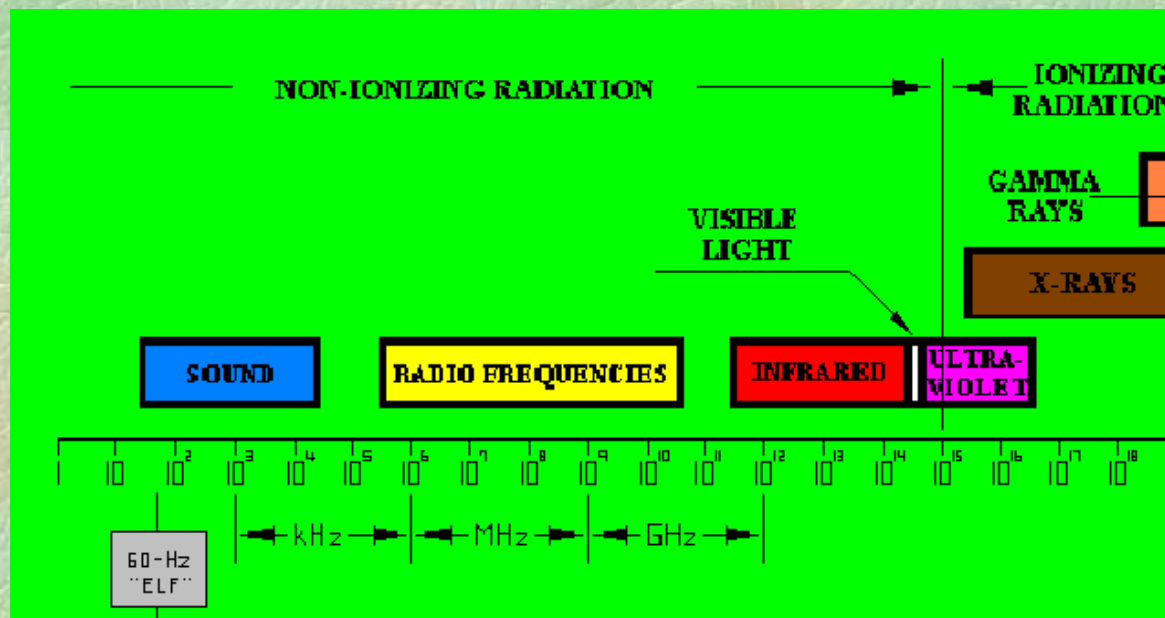
E = the energy potential of the electromagnetic energy

h = Planck's constant (approximately equal to 6.626×10^{-34} Joules-sec or 4.136×10^{-15} eV-sec)

ν = frequency

f = frequency

Radiofrequency Energy Production (cont'd)



Frequency	Associated Energy Levels (eV)
6.0 E+01 Hz (60 Hz)	2.48 E-13
3.0 E+03 Hz (3 kHz)	1.24 E-11
3.0 E+11 Hz (300 GHz)	1.24 E-03
9.41E+14 Hz	3.89 (first ionization level for Cesium atom)
3.0 E+15 Hz	12.4 (ionization level for water molecule)
5.95E+15 Hz	24.59 (first ionization level for Helium atom)

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Biological Effects of RF Radiation Exposure

☞ No fear?

☞ Hazards/Effects:

- Thermal
- Athermal
- Associated/Startle Reactions

Biological Effects of RF Radiation Exposure (cont'd)

☞ Incoming energy is:

- *Reflected* (due to natural conductivity of the saline solution that makes up most of our bodies)
- *Absorbed* (depends on the frequency, the tissue type and power level and the polarization of the incoming energy)
- *Passed* (depends on the frequency or wavelength)

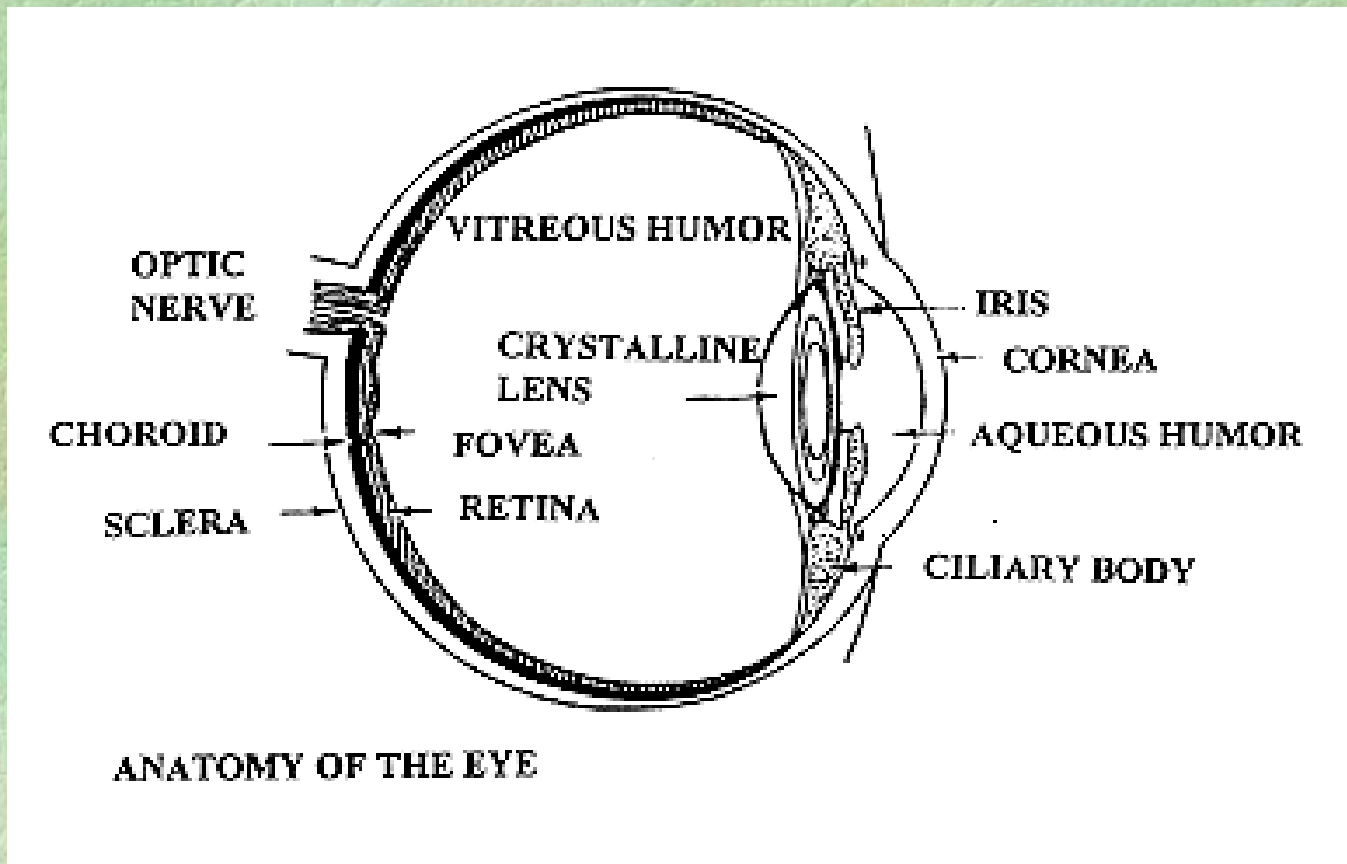
☞ Effects last only as long as the energy is present

Biological Effects of RF Radiation Exposure (cont'd)

☞ *Thermal Effects:*

- Last only as long as the energy is present
- Possible damage to organs (including tissue):
 - Eyes
 - Heart
 - Brain
 - Reproductive organs

Biological Effects of RF Radiation Exposure (cont'd)



Biological Effects of RF Radiation Exposure (cont'd)

☞ *Thermal Effects (cont'd):*

- Heat removal is crucial
 - evaporation
 - conduction
 - convection
 - radiation
 - exhalation
 - increased heart rate (analogous to automobile cooling system)

Biological Effects of RF Radiation Exposure (cont'd)

☞ Complicating factors:

- overexposure to warm environment
- vigorous activity
- medications
- improper or excessive clothing
- increased metabolic rate (due to thyroid hormone abnormalities which result in a condition known as *hyperthyroidism* resulting in increases in:
 - heart rate/stroke volume
 - oxygen consumption
 - peripheral blood flow
 - body temperature (possibly causing *hyperthermia*)

Biological Effects of RF Radiation Exposure (cont'd)

The Bottom Line:

Adding more heat energy than the body can effectively remove can lead to *hyperthermia*.

Biological Effects of RF Radiation Exposure (cont'd)

So far we've talked about “*WHOLE BODY IRRADIATION*”

What about “*PARTIAL-BODY IRRADIATION*” effects?

Localized heating of the eyes, heart, brain, reproductive organs, skin, hands, feet, etc. which can lead to burns, etc.

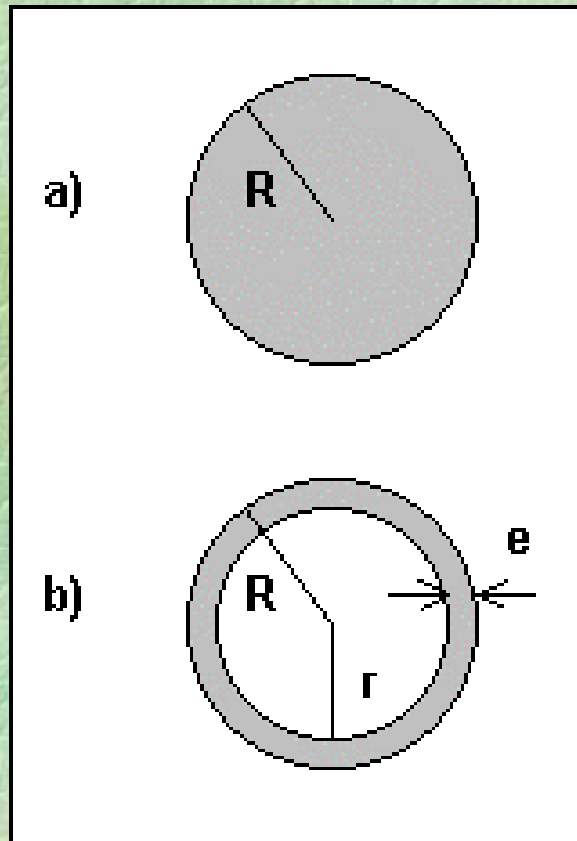
Biological Effects of RF Radiation Exposure (cont'd)

More Partial-Body Effects:

- * “***Skin-depth***” vs. frequency for conductors (including human tissue with saline content)

Higher frequency currents in a conductor tend to “crowd” the outer perimeters of that conductive material. Lower frequencies tend to be more distributed throughout the conductor.

Biological Effects of RF Radiation Exposure (cont'd)



SKIN EFFECT:

The apparent increase in a conductor's resistance to current flow that is directly proportional to the frequency of the current passing through it.....OR....The effective reduction of cross-sectional area in a conductor for alternating polarity currents (A.C. currents).

Biological Effects of RF Radiation Exposure (cont'd)

Below about 100 MHz, *RF current* can be induced into, then conducted *inside the body*. In some cases, the currents pass through small cross-sectional areas including:

- * ankles
- * wrists
- * knees

Problem Summary: High current densities cause localized tissue heating. The cells of human tissue begin to die when they are exposed to temperatures of about 41° Celsius or about 106° Fahrenheit.

Biological Effects of RF Radiation Exposure (cont'd)

☞ *Athermal Effects:*

- Last as long as the exposure lasts
 - Physiological effects on such areas as:
 - Body chemistry
 - Hormone production
 - Cell membrane thickness
- Complicating factors:
 - Exposure to certain hazardous chemicals or fumes can, with exposure to NIR, cause a temporarily weakened immune system, potentially allowing cancers to take hold

Biological Effects of RF Radiation Exposure (cont'd)

☞ *Athermal Effects (cont'd):*

- *All effects are not well understood, but are under considerable study by the scientific community. Any long-term athermal effects may only be known after much more investigation is completed.*

Biological Effects of RF Radiation Exposure (cont'd)

☞ *Associated Hazard Effects:*

- RF shocks
- RF burns
- Startle reactions

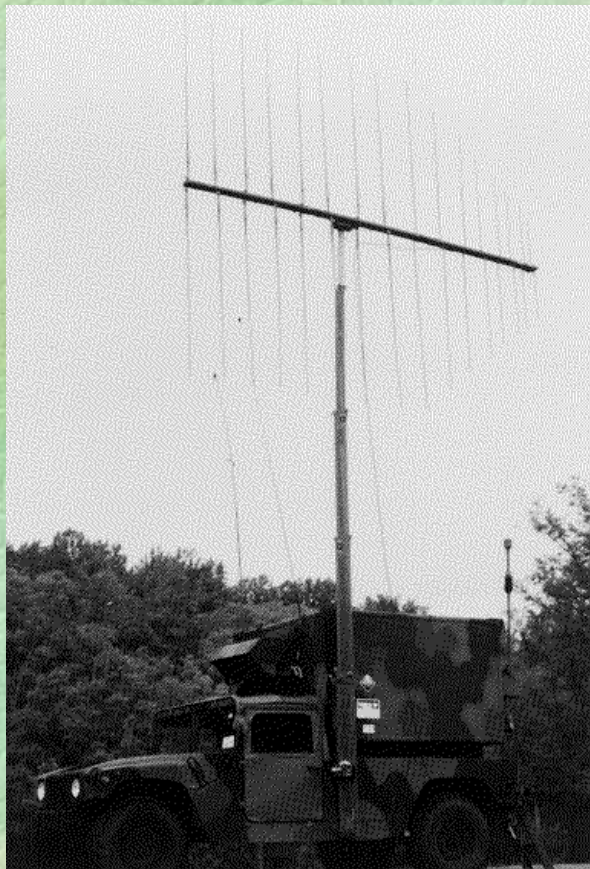
☞ Can any metallic object NOT associated with a source of RFR cause “associated hazard effects?” Yes

Biological Effects of RF Radiation Exposure (cont'd)



Avoid touching any corroded metallic areas when they may be exposed to nearby RF fields and do not touch exposed electrical connections like those on whip antennas when the system is transmitting.

Biological Effects of RF Radiation Exposure (cont'd)



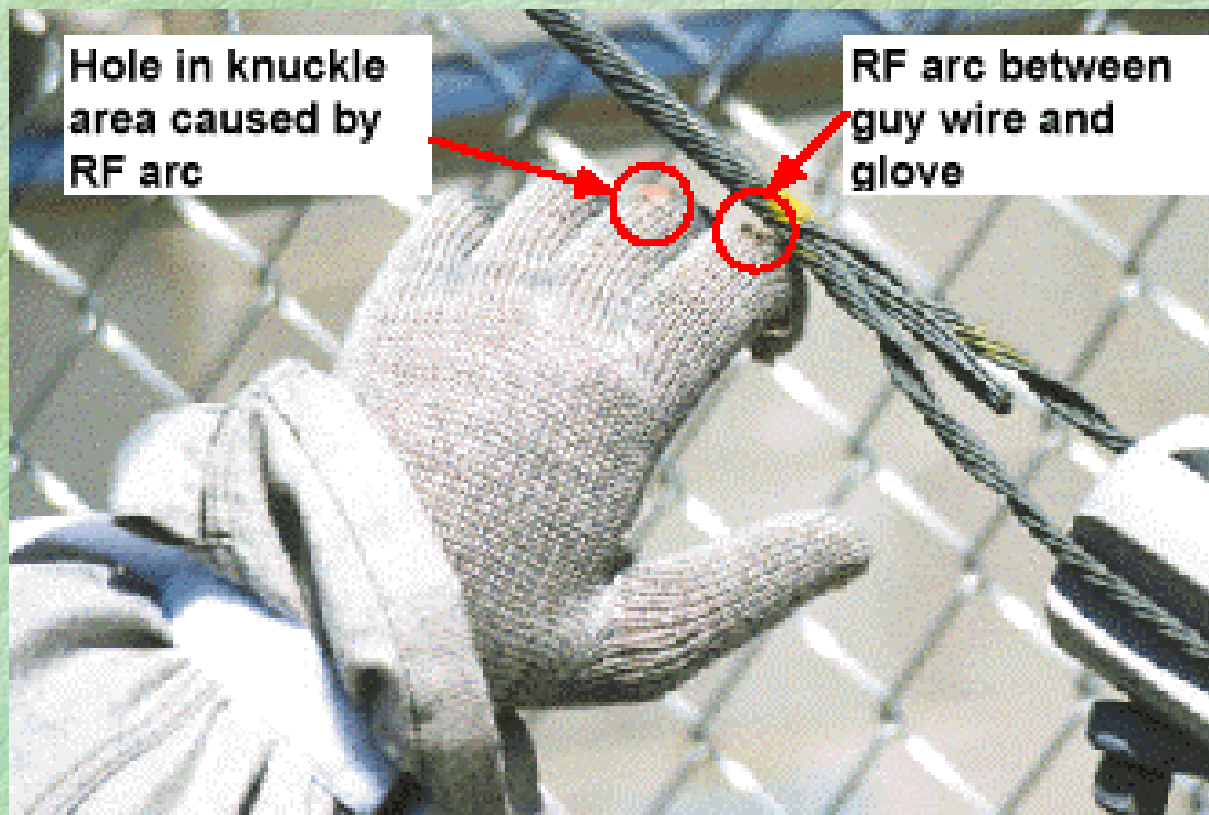
AN/TLQ-17A(V)

“TRAFFIC JAM”

Countermeasures Set

Avoid direct physical contact with exposed antenna elements and RF connections when the system is transmitting. Nearby metallic objects could be “energized” by the fields produced by an antenna’s radiation.

Biological Effects of RF Radiation Exposure (cont'd)



Conductors (any metallic object) that are exposed to RF fields may have large RF currents induced into them.

OUCH!!!

Biological Effects of RF Radiation Exposure (cont'd)

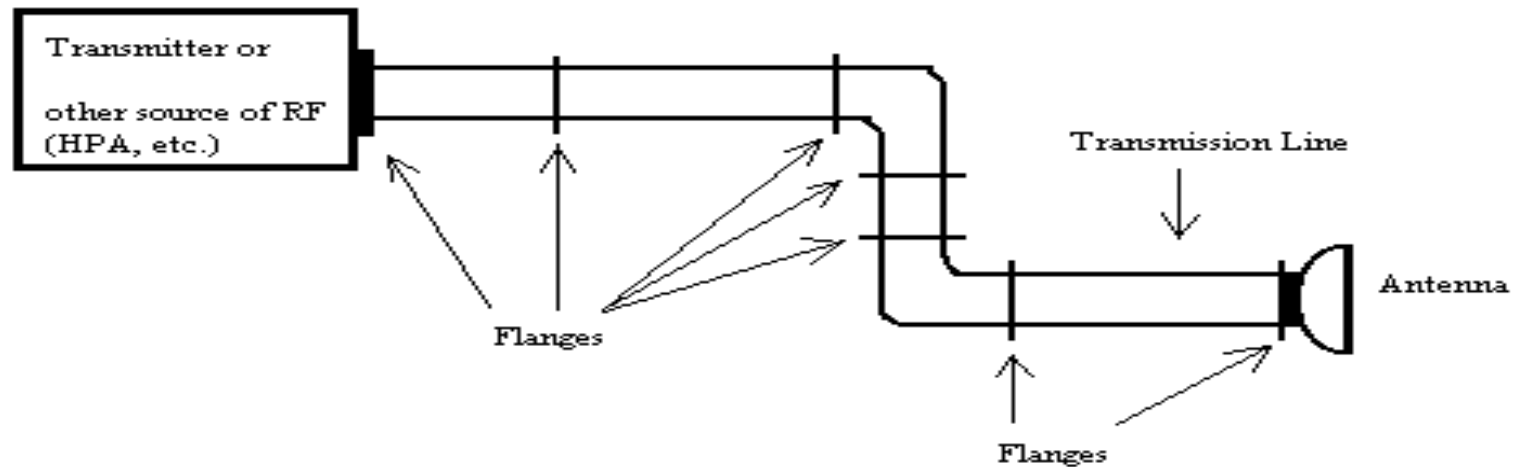
Bottom line:

Exposure to excessive amounts of non-ionizing radiation is unsafe. If one or more complicating conditions are also present the potential risks are multiplied accordingly and the effects can include RF shocks, burns, hyperthermia and secondary affects. Any of these could cause death!

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Where Could Radiofrequency Radiation Leaks Be Found?



Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

- ✿ At the transmitter
 - Cabinet leaks
 - Output connectors/flanges
- ✿ Along transmission/feed lines
- ✿ At connectors
- ✿ At waveguide flanges
- ✿ Near the antenna

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Types of transmission/feed lines:

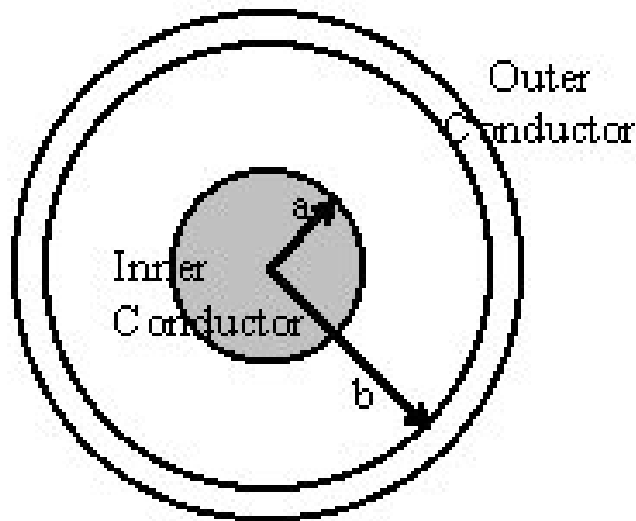
- Rigid (solid) waveguide (fields are confined)
 - circular
 - elliptical
 - rectangular
- Semi-rigid (corrugated) waveguide (fields are confined)
 - circular
 - elliptical

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Types of transmission/feed lines (cont'd):

- Flexible waveguide (fields are confined)
 - circular
 - elliptical
 - rectangular

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



The Coaxial “Feed”
-or-
Transmission Line

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Types of transmission/feed lines (cont'd):

- Coaxial cables (fields are *usually* confined)
 - Overall insulating jacket (environmental/physical protection)
 - Cylindrical conductor (rigid, flexible, braided, copper, aluminum, etc.)
 - Insulator/dielectric (air, solid, foamed, spacers, etc.)
 - Inner conductor (solid, stranded, hollow, copper, copper clad, etc.)

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Types of transmission/feed lines (cont'd):

- Coaxial cables (cont'd)

- ***Radiating Coax*** (e.g. Radiax®):

- Designed to radiate/"leak" RFR
 - Manufactured with "holes" in the outer conductor, then covered with the outer protective jacket
 - Used in tunnels, ships, tall buildings, subways, etc. to promote reliable communications
 - Designed for safe use

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

✿ Types of transmission/feed lines (cont'd):

- Open feed line (fields are NOT “contained” and in fact, fields surround each of the two conductors)
 - Twin-lead
 - Ladder-line

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Types of connectors:

- PL-259
- N
- HN
- BNC
- TNC
- 7/16" EIA
- C
- SC
- Etc.....

Connector Frequency Range Chart

Military Aerospace
Electronic Warfare

APC 2.4

APC 3.5

Test & Measurement
High Frequency
Communication

Instrumentation

Satcom (downlink)
Test & Measurement
Police Radar
Microwave Radio Links

Airborne Radar
Navigation Radar
Antenna
Base Stations

Satcom (uplink)

Telecommunications
Airport Search Radar
Test & Measurement
Datacom

Cable TV
Mobile Radio
Body Scanners

Broadcast TV
LAN

Point to Point
Cable Routers
LAN

APC-7 SMA

N

RP-TNC

TNC

1.0/
2.3 SMC

SWR

MMCX

MCX
BNC
50Ω

BNC
75Ω

SMB

P

FME

Mini-UHF

1.5/2.5

UHF

Tecan
8003

Tecan
8003

mm
40-100
GHz

Ka
26-40
GHz

K
18-26
GHz

Ku
12.4-18
GHz

X
8-12.4
GHz

C
4-8
GHz

S
2-4
GHz

L
1-2
GHz

UHF
300 MHz
1 GHz

VHF
100-300
MHz

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

✿ Flanges

- loose
- damaged
- open

✿ At/near the antenna:

- Loose connectors & flanges

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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OE-254/GRC (30-88 MHz)

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



Loose connectors can cause the coaxial cable to radiate.

In addition, be careful not to touch RF connectors or connections when transmit power is present.

Is the RF connection tight?

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ The antenna...an *intentional* radiator:

- *The antenna itself is NOT considered to be a “leak” of radiofrequency energy. It is an “intentional” radiator of radiofrequency energy.*
- *Areas of concern can include:*

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

- ❧ *The area between the antenna “feed” and any reflector or sub-reflector*
- ❧ *The area directly in front of a uni-directional antenna (e.g. dish type), specifically in the antenna’s “mainbeam”*
- ❧ *The area directly surrounding an omni-directional antenna*

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)



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Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ It's just a small hole...why should I care?

- Garden hose analogy:
 - severity of leak depends on
 - pressure in the hose
 - viscosity of fluid in the hose
 - physical size of leak
 -
 - portion of body exposed
 - exposure time

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

- ☞ Pressure in hose in pounds per square inch (psi) is analogous to the power density in a transmission line which is measured in terms of Watts per square inch or, more commonly, milliwatts per square centimeter.
 - More force per unit area is more damaging (the bolt *vs.* the needle)
- ☞ Viscosity of the fluid *vs.* the wavelength of the signal.
 - For the same physical size “leak” a fluid with higher viscosity (is thicker) will flow less over some period of time than will a fluid of lesser viscosity over the same period of time.
 - For the same physical size “aperture” a signal at one wavelength may “leak” more per unit time than another wavelength.

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

- The larger the physical leak the more the leakage over time
- The farther away a leak is from the source the less RF power will be “leaked” (note that this analogy does NOT apply to a water leak)
- Depending on the part of the body exposed there will be more or less concern over the exposure
- The longer a leak exists, the more will be leaked and more exposure means more potential damage

Where Could Radiofrequency Radiation Leaks Be Found? (cont'd)

☞ Severity of *FLUID* leak depends on:

- Pressure in the hose
- Viscosity of fluid
- n/a
- Size of leak
- Portion of body exposed
- Exposure time

☞ Relative danger of any given *RF* leak depends on:

- Power level/power density
- Frequency/wavelength
- Location of leak wrt source
- Size of leak
- Portion of body exposed
- Exposure time

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Inspection Techniques

✂ Before inspecting

- *Disable transmitter/source of RF energy*

Inspection Techniques

☞ What to look at:

- Connectors:

- fastened securely?
- unsoldered/improperly soldered?
- broken parts?
- missing?

Inspection Techniques

☞ What to look at (cont'd):

- Flanges/fittings:
 - loose?
 - misaligned/improperly installed?
 - damaged/defective gaskets?
- Open or un-terminated waveguide sections?

Inspection Techniques

☞ What to look at (cont'd):

- Transmission line/feed line?
 - Signs of fatigue, aging, damage, etc.
 - damaged sections (cuts/nicks/gouges/non-cylindrical shape)
 - breaks
 - sections prone to vibration or rough handling
 - sections frequently moved/jostled about

Inspection Techniques

☞ What to look at (cont'd):

- Open or non-terminated waveguide sections?

Inspection Techniques (cont'd)

☞ What to do:

- Consult owners/operators/maintenance manuals
- Don't attempt to repair damaged sections of waveguide
- Replace damaged/defective sections
- Don't operate until repairs/replacements are complete

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Diagnostic Tools

☞ Pressurized transmission lines

- pressure gages
- pressure sensors
- low pressure alarms
- arcing noise

☞ Directional wattmeters/sensors

- high VSWR/SWR levels

Diagnostic Tools (cont'd)

☞ RADHAZ (radiation hazard/power density/field strength instruments)

- false sense of security
- high expense (initially and periodically for repairs & calib.)
- periodic calibrations req'd
- fragile probes (mechanically & electrically)
- knowledge/experience issues
 - limits (PELs) vs. frequency/applications)
 - proper probe(s) for the job
 - frequency
 - power density/field levels expected
 - H-field vs. E-field

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Specifications and Standards

DoDI 6055.11: Protection of DoD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers

- Adopted the RF exposure guidelines of IEEE C95.1
- Applies to all DoD civilian and military personnel (except those under the care of a physician)
- Applies to operations during peacetime and to wartime (to the maximum extent possible)

Specifications and Standards (cont'd)

DoDI 6055.11 stipulates the following:

- Identify, attenuate, or control by engineering design, protective equipment, administrative actions, or a combination thereof, hazardous RF EMF and other dangers associated with DoD electronic equipment
- Limit personnel RF exposure to levels that are within the permissible exposure limits (PELs)
- Define and control the area in which RF exposure to personnel could exceed the PEL
- Ensure personnel are aware of potential RF exposures in their workplaces and duty assignments, and the control measures imposed to limit their RF exposures
- Investigate and document any RF overexposure incidents

Specifications and Standards (cont'd)

DoDI 6055.11 details the responsibilities for all of the DoD:

- The Deputy Undersecretary of Defense for Environmental Security is the DoD Designated Agency Safety and Health Official
- The Heads of the DoD Components shall establish and maintain RF EMF and laser protection programs under the cognizance of the DoD Components (Safety and Occupational Health Officials) to carry out DoD 6055.11

Specifications and Standards (cont'd)

- *RF PELs are derived from IEEE C95.1 which serves as a consensus standard developed by representatives of industry, scientific communities, Government Agencies, and the public
- *The basic dosimetric parameter for RF exposure is a whole-body specific absorption rate (SAR) of 4.0 watts-per-kilogram (W/kg) of tissue mass (the rate determined to be a threshold for occurrence of potentially deleterious biological effects in humans).
- *The PELs are based upon 1/10th this rate or 0.4 W/kg of tissue mass
- *The SAR is used to denote the energy absorbed averaged over some period of time (sometimes 6-min, sometimes less depending on the freq.)

Specifications and Standards (cont'd)

- *Two different limits are provided:

- ***Controlled Environments**

- *An environment where the potential for RF exposures may exist as a concomitant of employment or duties.

- ***Uncontrolled Environments**

- *An environment where there could be exposure to individuals who have no knowledge or control of their exposure. Examples of such locations would be living quarters, workplaces, etc.

Specifications and Standards (cont'd)

Other significant documents include:

* *DAOTSG Memorandum, 11 April 1994, subject: Vision and Ocular Assessments of Personnel in Laser and Radiofrequency Radiation Environments.* This document includes:

** requirements for vision/ocular assessments for RF workers only in the event of a known overexposure to RFR (in excess of five (5) times the Permissible Exposure Limit (PEL)).

** For any known or suspected overexposure to RFR, contact the installation RSO.

Specifications and Standards (cont'd)

* NGR 385-11, *Ionizing and Non-ionizing Radiation Protection*. This document supplements the guidance provided by DoDI 6055.11, Protection of DoD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers. It also establishes policies, defines responsibilities and prescribes procedures which will ensure personnel safety during the operation and maintenance of radiofrequency (RF) and laser radiation producing equipment within the ARNG.

Specifications and Standards (cont'd)

* **TB MED 523**, *Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound*. This document is currently being revised by the Center for Health Promotion and Preventive Medicine (CHPPM).

* **TB 43-0133**, *Hazard Criteria for CECOM Radiofrequency and Optical Radiation Producing Equipment*. This document identifies CECOM equipment (and some equipment from other commands) that have the potential to produce RFR and/or optical radiation. Operators and maintenance personnel of listed equipment can use the information to assess the potential RF and/or optical radiation hazard and health risks associated with a particular system.

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Installation Program Requirements

- ✿ Stipulate the parties responsible for ensuring an adequate Non-ionizing Radiation Safety Program (NIRSP/NRSP) to include:
 - Establishment of a Radiation Control Committee (RCC)/Officer (RCO)
 - Appointment of an installation Radiation Safety Officer (RSO)
 - Appointment of a State or Local Radiation Safety Officer (SRSO/LRSO)

Installation Program Requirements (cont'd)

- ✿ Army guidance for running an effective NIRSP/NRSP
 - AR 40-5 (Preventive Medicine), Chapter 9 (Radiation Protection)
- ✿ Army National Guard guidance
 - NGR 385-11 (Safety, Ionizing and Nonionizing Radiation Protection)

Installation Program Requirements (cont'd)

• General guidance for running an effective NIRSP/NRSP includes:

- Knowledge that CHPPM has evaluated all Potentially hazardous NIR equipment/systems before fielding
- Personnel are to be informed of any potential hazards of NIR producing equipment.
- Publication and enforcement of SOPs

Installation Program Requirements (cont'd)

☞ General guidance (cont'd):

- Periodic checks of safety devices (interlocks, limit/sector switches, etc.)
- All controlled areas are posted as required
- Comprehensive inventory of all Nonionizing radiation producing sources is maintained

Installation Program Requirements (cont'd)



AN/TSC-85

Satellite Communications Terminal

Installation Program Requirements (cont'd)



AN/TPQ-36 Firefinder
Radar with its
Planar Phased Array
Antenna

Is this
electronically-
scanning antenna
transmitting?

Installation Program Requirements (cont'd)

• General guidance (cont'd):

- An up to date listing of workers that use or repair NIR emitting equipment is maintained
- Initial, periodic and refresher NIR training is provided
- Alleged overexposures are reported up through channels

Installation Program Requirements (cont'd)



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Vision and Ocular Assessments of RF Workers

Requirements are per:

Memorandum, Department of the Army, Office of the Surgeon General, 11 Apr 94, subject: Vision and Ocular Assessments of Personnel in Laser and Radiofrequency Radiation Environments

- a) RF radiation workers have no vision-screening requirements beyond that done routinely in pre-placement physicals or under other occupational health guidelines.
- b) Vision/ocular assessments are required only in the event of a known overexposure to RF radiation (RFR) in excess of five (5) times the Permissible Exposure Limit (PEL).

You ask “how would I know?”
02/21/2003

Vision and Ocular Assessments of RF Workers (cont'd)

ANSWERS:

1) Knowing whether you may or may not have been overexposed should be based upon some level of certainty. This certainty could come from knowing the information found in one of the previously mentioned slides which referenced the following document:

** **TB 43-0133**, Hazard Criteria for CECOM Radiofrequency and Optical Radiation Producing Equipment. This document identifies CECOM equipment (and some equipment from other commands) that have the potential to produce RFR and/or optical radiation. Operators and maintenance personnel of listed equipment can use the information to assess the potential RF and/or optical radiation hazard and health risks associated with a particular system.*

Vision and Ocular Assessments of RF Workers (cont'd)

ANSWERS (cont'd):

2) *For commercial equipment, the relevant information should be addressed in the applicable operator/user or maintenance manuals.*

3) *When in doubt (and in the case of a suspected overexposure), contact **CECOM, Directorate for Safety (DS)** who can assist you in that determination and advise of any potentially dangerous areas or operating conditions which should be addressed in any standing operating procedures (SOPs).*

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What To Do In The Case of a Suspected Overexposure

NGR 385-11 (Ionizing and NonIonizing Radiation Protection), paragraph 3-5 (Accident Reporting) states that should an alleged over-exposure occur, **the affected activity will:**

1. **Disable the power** from the system that caused the potential exposure but *do not alter the configuration* of the system.
3. **Notify the chain of command** and the **SRSO (or LSO/RFSO)**
4. Ensure that the potentially exposed individuals(s) receives an appropriate **medical evaluation within 24 hours** of the exposure.

What To Do In The Case of a Suspected Overexposure (cont'd)

4. **Notify the NGB RCO** within 24 hours at the number provided in APPENDIX D of NGR 385-11.
5. **Notify the USACHPPM** within 24 hours to forward incident information. During duty hours, contact the Radiofrequency Program at DSN 584-3353. During non-duty hours, contact the CHPPM staff duty officer at DSN 584-4375.
6. Develop and **transmit an RCS MED-16 report** per AR 40-400, and **RCS DD-R&E (AR) 1168 (Radiological Incident Report)** per AR 385-40.

What To Do In The Case of a Suspected Overexposure (cont'd)

The radiological hygiene consultant to the Surgeon General will request that USACHPPM conduct an on-site investigation when:

(1) An employee's lesion or ocular complaint may have resulted from exposure to non-ionizing radiation.

(2) An exposure to RF radiation is five (or more) times the Permissible Exposure Limit (PEL) of DoDI 6055.11.

What To Do In The Case of a Suspected Overexposure (cont'd)

USACHPPM will conduct investigations of alleged laser or RF radiation exposures and will maintain the U.S. Army Laser and RF Radiation Incident Registry.

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Final Note

Though non-ionizing energy and radiation cannot be seen, we must use our knowledge to know where it may be so that we can guard against overexposures and injury.